FROM: HQ AFCESA/CES
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SUBJECT: **Engineering Technical Letter (ETL) 97-11: Mitigation of Non-Structural Seismic and High Wind Deficiencies for Existing Buildings**

1. Purpose. This ETL provides guidance to help the Base Civil Engineer (BCE) and other users establish minimum standards of performance to mitigate non-structural deficiencies in Air Force buildings subject to seismic events and high winds.

2. Application: All U.S. Air Force installations.

2.1. Authority. Presidential Executive Order 12941, *Seismic Safety of Existing Federally Owned and Leased Buildings.*

2.2. Effective Date: Immediately. Expires five years from date of issue.

3. Referenced Publications.

3.1. AFJMAN 32-1049V3*, Seismic Design Guidelines for Upgrading Existing Buildings* (previously AFM 88-3, Chap 13).

3.2. ETL 93-3, *Inventory, Screening, Prioritization, and Evaluation of Existing Buildings for Seismic Risk*

3.3. Federal Emergency Management Agency (FEMA) 74, *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, 1994.

3.4. FEMA 178, *NEHRP Handbook for Seismic Evaluation of Existing Buildings*, June 1992.

3.5. FEMA 273, *NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, *(Ballot Version)*, September 1996.

3.6. 1996 National Seismic Hazard Maps, U.S. Geological Survey, 15 Nov 96, 10% Probability of Exceedance in 50 Years, 0.2 sec Spectral Acceleration (http://wwwneic.cr.usgs.gov/eq/finmaps.shtml).

3.7. ASCE 7-95, *Minimum Design Loads for Buildings and Other Structures,* (ASCE 7-95 a revision of ANSI/ASCE 7-93), American Society of Civil Engineers (ASCE), 1996.

4. Definitions.

4.1. *High Seismic Zone*: Building site for which the EQ-II (basic design earthquake), 10%/50 years for Soil Profile Type B, spectral acceleration in the short-period range (S_{DS}) is equal to or greater than 50 percent. Included in this category within the continental United States are Eielson AFB, Elmendorf AFB, March ARB, Los Angeles AFB, Travis AFB, Vandenberg AFB, and McChord AFB.

4.2. *Moderate Seismic Zone*: Building site for which the EQ-II S_{DS} (see para 4.1) is equal to or greater than 16 percent but not more than 50 percent. Sites in the U.S. include Beale AFB, Charleston AFB, Edwards AFB, Hickam AFB, Hill AFB, Kirtland AFB, McClellan AFB, Mountain Home AFB, Nellis AFB, Scott AFB, and Shaw AFB.

4.3. *Low Seismic Zone*: Building site not in the high or moderate zones.

4.4. *High Wind Region*: Building site where the basic wind speed, V, as determined from Figure 6-1, ASCE 7-95, is greater than or equal to 177 km/h (110 mph) or the site is located within 161 kilometers (100 miles) of the hurricane oceanline. These regions include areas vulnerable to hurricanes, such as the U.S. Atlantic and Gulf Coasts, Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa as defined in Table 6-4, ASCE 7-95. Overseas, high wind region installations include those with comparable wind hazards based upon regional design criteria or climatic data.

5. Requirements.

5.1. Objective of Nonstructural Mitigation. Buildings subjected to seismic events and high winds may be expected to incur significant and costly damage. The objective of mitigation is to assure that non-structural components will not dislodge, fall, blow away, or otherwise threaten the lives and safety of those inside or outside the building. Egress routes within the building may have light-weight debris on the floor but not enough to hinder exit from or entrance to the building. Heating/ventilation/air conditioning (HVAC), plumbing, and fire suppression systems may be damaged, resulting in local flooding. The failure of nonstructural components during an earthquake may cause injuries, but the expectation of life threatening injury is very low. Buildings located in low seismic zones are not included in the requirement for mitigation of nonstructural component deficiencies.

5.2. Deficiencies Matrix. The following matrix defines seismic and high wind area components that require mitigation. Mitigation involves structural modification to enable the component to sustain the expected seismic or wind loads, or employment of other restraints to prevent life threatening situations. Components checked on the matrix must comply with the minimum requirements of FEMA 178, Chapter 10, for expected seismic or wind loads and building performance category. Mitigation is complete when the nonstructural component checklist in FEMA 178, Appendix A, has been completed with only “true” answers. Wind mitigation applies to exterior components only. Reference ETL 93-3 for discussion of Performance Categories.

Component	Performance Categories I and III		Performance Categories IV and V	
	High	Mod	High	Mod
Architectural				
Exterior:				
• Adhered veneer	√	√	√	√
• Anchored veneer	√	√	√	√
• Prefabricated panels	√	√	√	√
• Glazing systems	√	√	√	√
Partitions:				
• Heavy, on egress routes	√	√	√	
• Heavy, not on egress route	√			
• Light, or less than 1.2 m (4 ft)	√			
Interior Veneers - Ceramic Tile	√	√	√	
Ceilings:				
• Dropped, furred, gypsum board	√		√	
• Suspended lath and plaster	√	√	√	√
• Suspended ceilings egress route	√	√	√	
• Suspended ceilings non-egress	√			
Parapets	√	√	√	√
Canopies and Marquees	√	√	√	√
Chimneys and Stacks	√	√	√	√
Stairs and Stairwells	√	√	√	
Mechanical Systems				
Mechanical Equipment:				
• Boilers and furnaces	√	√	√	√
• HVAC, not vibration-isolated	√	√	√	
• Storage vessels	√	√		
• High-pressure piping	√	√	√	
• Natural or propane gas piping	√	√	√	√
• Fire suppression piping	√	√		
• Hazardous materials piping	√	√	√	√
Other				
Electrical and Communications Equipment:	√		√	
• Light fixtures				
- Recessed				
- Surface-mounted				
- Integrated with ceiling	√	√	√	
- Pendant more than 9 kg (20 lb)	√	√	√	
• Elevators	√	√	√	√
• Hazardous material storage	√	√	√	√
Furnishings				
• Bookcases over 1.8 m (6 ft)	√		√	
• Storage racks (occupied buildings)	√		√	

Notes:
1. Ceiling systems that weigh less than 9.7 kg/m^2 (2 lb/ft^2) and are not in routes of egress are exempt from the mitigation requirements.
2. Electrical and communications equipment is to be mitigated only when the individual equipment is over 1.8 meters (6 feet) high or the equipment is part of an emergency lighting and communications system.

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